Celiac artery thrombosis in a young patient with multiple platelet receptor polymorphisms and local compression syndrome

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Numerous clinical and experimental studies have been published concerning platelet receptor polymorphism and their role in causing myocardial infarction at an earlier age. It is still unclear, however, whether these polymorphisms are a risk factor for other occlusive diseases such as those in visceral arteries. We report a case of a young woman with acute celiac artery thrombosis and multiple platelet receptor polymorphisms. In addition, the intraoperative exploration showed some evidence of a local vascular compression syndrome. The patient was successfully treated with a bypass procedure and combined anticoagulation. It seems that platelet receptor polymorphisms are a moderate risk factor for local artery thrombosis regardless of vascular region. The obligatory precondition is pre-existing vascular damage, such as that caused by a local compression syndrome. (J Vasc Surg 2008;48:1335-7.)

Since the first description of platelet receptor polymorphisms in the mid-1990s, numerous clinical and experimental studies have been published concerning their role.[1-5] These studies have confirmed that coronary infarctions are more common and occur at an earlier age.

To date there is still a lack of information on a possible causal relation between platelet receptor polymorphism and occlusion of other arterial beds except those of the coronary system. Our report describes a case of celiac artery occlusion in a young patient with multiple platelet receptor polymorphisms.

CASE REPORT

A 20-year-old woman suffered from discomfort and pain in the upper abdomen for several months. Her complaints were not related to food intake and no weight loss could be detected. Prior to admission, the severity and the frequency of the symptoms increased.

At onset of diarrhea, the patient presented at a local hospital. After 3 days of unsuccessful conservative medical treatment on an outpatient basis, she was admitted. On admittance, the septic patient presented with an acute abdomen. Under the working diagnosis "appendicitis," a laparoscopic appendectomy was performed. The appendix appeared macroscopically and histologically normal. Abdominal inspection showed a "moderate swelling of the small bowel."

Upon further deterioration of her condition during the following 3 days with fever, elevation of leucocytes and C-reactive protein, and signs of peritonitis (Table), the patient underwent computed tomography (CT) scanning. The images revealed a complete infarction of the spleen and occlusion of the celiac artery due to a thrombus extending into the aorta (Fig 1). Cholecystitis and ischemia of the right colic flexure were suspected.

The emergency operation confirmed gangrene of the gallbladder, irreversible ischemia of the terminal ileum, and complete infarction of the spleen. The abdomen was opened by median laparotomy, and the celiac artery was exposed by dissecting the smaller omentum. After a C-shaped incision of the aorta was made at the ostium of the celiac artery, the thrombectomy was performed by balloon.

The red thrombus was several days old and clearly adherent to the vessel wall, which showed no evidence of atherosclerotic alterations. However, the celiac artery was critically compressed by the arcuate ligaments, which is typical for celiac artery compression syndrome (CACS). Dividing these ligaments resulted in a complete freeing of the celiac artery, so no further revascularization procedure seemed necessary. The superior mesenteric artery was open and perfused.

After revascularization, cholecystectomy and resection of the ischemic terminal ileum were performed.

A CT scan performed the following day showed reocclusion of the celiac trunk (Fig 2). An immediate relaparotomy confirmed reduced hepatic perfusion. Revascularization was possible by only an aortohepatic bypass to the right hepatic artery using the saphenous vein. For intraoperative bypass control, Doppler sonography was used.

Postoperative CT angiography showed a patent reconstruction but reduced perfusion of the left hepatic lobe (Fig 3). Because of threatening liver failure, the patient was transferred to a center for liver and transplantation surgery.

The further course of vascular reconstruction was uneventful.

The thrombophilia workup excluded factor V Leiden mutation; prothrombin mutation; protein C, protein S, and antithrombin deficiency; and methylenetetrahydrofolate reductase polymorphism. Other clinical causes, such as pregnancy, malignancy, dehydration, and oral contraceptives, were not present. However, two platelet

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Competition of interest: none.

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Table. Laboratory findings

	Result	*Normal range*
Leucocytes	40.5/nL	<10.0/nL
Platelets	507/nL	150-350/nL
Hemoglobin	11.9 g/%	12.3-15.3 g/%
Potassium	3.2 mmol/L	3.6-5.0 mmol/L
Lactate dehydrogenase	358 U/L	<248 U/L
Serum glutamic-oxaloacetic transaminase (SGOT)	43 U/L	<35 U/L
Serum glutamic-pyruvic transaminase (SGPT)	41 U/L	>34 U/L
Cholinesterase	3.0 U/L	4.7-10.4 U/L
Alpha-amylase	250 U/L	30-110 U/L
C-reactive protein	33.0 mg/%	<1.0 mg/%
Fibrinogen	1189 mg/%	200-450 mg/%
D-dimer	1.010 μg/mL	0.24 μg/mL

Findings were normal for sodium, alkaline phosphatase, creatinine kinase, lipase, creatinin, urea, bilirubin, cholesterol, triglycerides, glucose, thrombin time, and antithrombin.

Fig 1. Computed tomography scan on admission shows thrombosis of celiac trunk.

receptor polymorphisms, each responsible for moderate procoagulatory disorder were found (GP IIIa-polymorphism HPA 1b-allele, GP Ia-IIa-polymorphism GP Ia C807T). Furthermore, we suspected heparin-induced thrombocytopenia type 2 because of a positive heparin-induced platelet activation test despite normal thrombocyte count, negative antibodies, and lack of white clots intraoperatively. Anticoagulation was continued with hirudin and aspirin perioperatively; the patient was discharged on warfarin medication. The CT follow-up 12 months later showed a patent bypass.

DISCUSSION

Acute occlusion of visceral arteries are rare in young patients. The most common cause is fibromuscular displasia or vessel dissection in congenital diseases of the connective tissue (Marfan and Ehlers-Danlos syndrome). The role of platelet hyperreactivity due to genetically determined polymorphism in platelet receptors is still not fully understood.

Thrombocyte receptors are polymorphic glycoproteins, most of which are intergrins that carry diallele alloantigens. These alloantigens are human platelet antigens (HPAs). Among the most important integrins are $\alpha_{IIb}\beta_3$ (HUGO gene nomenclature ITGA2B ITGB3), also known as glycoprotein IIb-IIIa, and $\alpha_2\beta_1$ (HUGO gene nomenclature ITGA2 ITGB1), known as glycoprotein Ia-IIa.[6]

The IIb-IIIa-receptor binds to fibrinogen, von Willebrand factor, fibronectin, vitronectin, and thrombospondin. The receptor mediates thrombocyte aggregation. The β_3 subunit carries HPA-1.[6] A higher risk of myocardial ischemia has been documented for carriers of the HPA-1b allele,[2] and more recent reports have discussed the importance of these findings.[3]

The Ia-IIa-receptor mediates binding to collagen. Its α_2 subunit is polymorphic in section C807T. The α_2–807TT genotype is associated with enhanced receptor expression on the thrombocyte membrane. In vitro this condition leads to increased binding to collagen. The clinical relevance of this polymorphism, for example with respect to myocardial ischemia, is also a matter of discussion.[4]

In a recent study involving over 3000 patients, Zotz et al[5] were able to show that individuals carrying the HPA-1b allele or those with the α_2-807TT genotype are at risk of myocardial infarction 5.2 or 6.3 years earlier than those without. However, these findings applied to only patients with histories of coronary disease.

The potential risk factor of platelet receptor polymorphisms in visceral ischemias and other vascular beds except the coronary system has not yet been studied.

We present a case of a young patient showing subacute thrombotic occlusion of the celiac artery with CACS and multiple platelet receptor polymorphisms (HPA-1b of the GP IIb-IIIa receptor and α_2-807TT of the GP Ia-IIa receptor). Thrombectomy and decompression of the celiac artery alone led to rethrombosis. Successful revascularization was achieved only by bypassing the altered celiac artery and adminstering high-dosage anticoagulants.

Thrombotic occlusion of the celiac artery is not common in CACS. In our opinion, the combination of multiple receptor polymorphisms and damage to the vascular wall due to CACS played the pivotal role in this case.

We think the small-bowel ischemia was caused by embolism attributable to thrombotic material at the orifice of the celiac artery/aorta.

Platelet receptor polymorphism alone without preconditioning morphologic damage of the vascular wall does not seem to be associated with a higher rate of thrombembolic events in the arterial system. Therefore, a specific treatment is not necessary; anticoagulation therapy especially seems inappropriate.

In contrast, vascular damages, mostly atherosclerotic lesions, demand a continuing antithrombotic treatment. The role of coumadines remains unclear.

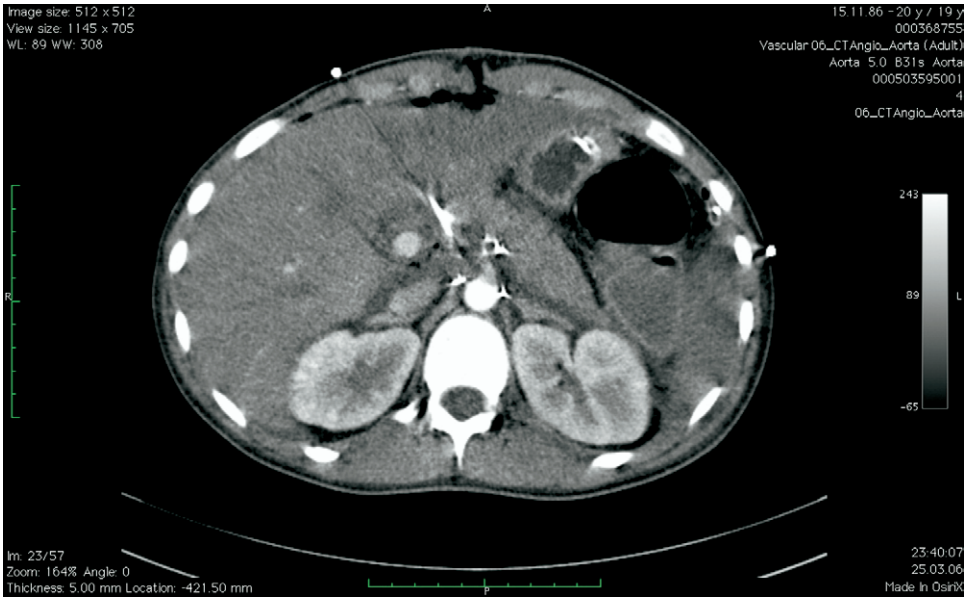

Fig 2. Computed tomography scan on first postoperative day shows rethrombosis of celiac trunk.

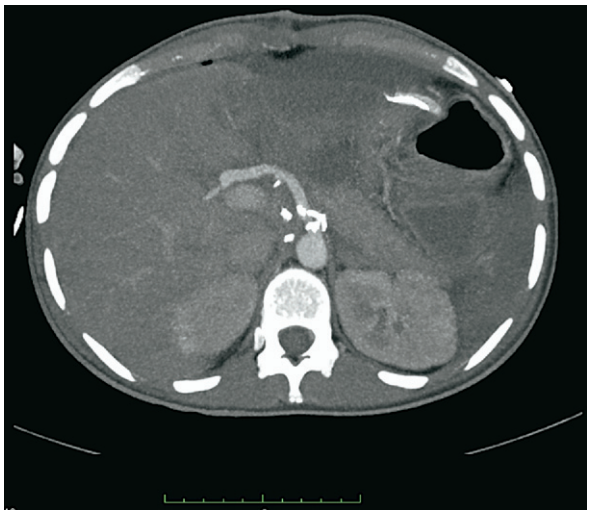

Fig 3. Computed tomography scan after successful revascularization by vein graft to right hepatic artery.

CONCLUSIONS

Thrombocyte receptor polymorphism may very likely be a moderate risk factor for arterial thromboses when damage to the vascular wall is present. Platelet receptor polymorphism should be excluded in young patients with unclear thrombembolic events in the arterial system.

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AUTHOR CONTRIBUTIONS

Conception and design: JR, SP, FS, RZ, WS
Analysis and interpretation: JR, SP, FS, RZ, WS
Data collection: JR, SP
Writing the article: JR, SP
Critical revision of the article: JR, SP, FS, RZ, WS
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